

**Assessment of the Status of the Sport
Fishery for Walleye at Pinehurst Lake, 2000.**

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ABSTRACT

To recover or maintain Alberta's walleye fisheries, a new walleye management strategy was implemented in 1996. In 1996, the walleye fishery at Pinehurst Lake was classified as stable and a 43 cm maximum total length (TL max) minimum size limit on walleye was implemented in the sport fishery. After creel survey in 1997, the walleye fishery was reclassified as vulnerable and a 50 cm TL max was implemented. In order to verify the 1997 assessment of the status of the walleye fishery at Pinehurst Lake, a creel survey was conducted during May to August 2000. During the 2000 survey, the number of anglers utilizing the creel site was 1,572. The estimated number of anglers during the 2000 survey was 5,128 (including a derby during June). Angling pressure was 5.4 angler-hours / hectare. This is a 22% decrease in angling pressure since 1997 (6.9 hrs / ha) and a 48% decrease since the 1994 survey (10.4 hrs / ha).

The estimated harvest of legal-size walleye was 1,315. The harvest rate on walleye >50 cm (TL max) has increased 2.1 times from 0.032 walleye kept / hour in 1997 to 0.068 in 2000. However, since the 1997 survey, the estimated release rate on walleye <50 cm (TL max) or sublegal size has decreased 40% from 0.506 fish / hour to 0.303 fish / hour in 2000.

Based on the criteria used to classify walleye stocks in Alberta, the walleye fishery at Pinehurst Lake remains vulnerable.

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INTRODUCTION

Walleye (*Stizostedion vitreum*) populations in Alberta have been subjected to heavy fishing pressure for many years. Most populations show signs of over-harvest, with many experiencing significant declines. Previous management strategies have focused on province-wide regulations designed to manage the walleye harvest at an average fishery. Fisheries receiving heavier than average exploitation have not been adequately protected with these regulations and consequently many have declined or collapsed. To aid the recovery of these fisheries, a new walleye management strategy was implemented in 1996. This strategy requires that each walleye population be evaluated as to its degree of exploitation and is then placed in one of these categories: collapsed, vulnerable, or stable. The fishery is assigned a standard sport fishing regulation based on this status (Sullivan 1994). In early 1996, the walleye fishery at Pinehurst Lake was assigned a stable status. A 43 cm maximum total length (TL max) minimum size and a 3 fish daily bag limit on walleye was therefore implemented at the fishery. After a survey 1997, the status of walleye at Pinehurst Lake was changed to vulnerable and a 50 cm TL max minimum size was implemented.

This report describes the creel survey conducted at Pinehurst Lake during the summer of 2000. The purpose of the survey was to monitor the walleye sport fishery and the status of the population and fishery.

METHODS

Study Site Description

Pinehurst Lake (TWP 65, RNG 10, W4M) is approximately 45 kilometres southeast of the Town of Lac La Biche. Pinehurst Lake has a surface area of 4,070 hectare and a maximum depth of 24 metres. Alberta NRS staff maintain the recreation area campground. Rental cabins are located on the only section of privately owned beach along the east shore of the lake.

The trophic status of Pinehurst Lake is eutrophic. The lake is in the Beaver River Basin and is fed by 5 intermittent streams. Pinehurst Lake is drained by Punk Creek. A more complete description of the physical, chemical and biological characteristics may be found in Mitchell and Prepas (1990).

Methods of Study

One creel survey crew (two biotechnicians) collected information from both Pinehurst Lake and Beaver Lake between 19 May - 20 August 2000. At Pinehurst Lake, the crew was stationed at Pinehurst Lake recreation area campground. A schedule of 5 survey days at Pinehurst Lake (Wednesdays through Sundays) was preceded by 5 survey days at Beaver Lake (Fridays through Tuesdays). Each shift was followed by 4 days off. This cycle was repeated 7 times during the study.

The methods of the creel survey, the collection of creel data, biological data, angling test fishery data, data management and verification procedures, the calculation of sport fishery parameters specific to the creel survey site and the fishery and the whole lake surveys were conducted following Patterson 1999.

Several important parameters relating to compliance and reporting bias were calculated using test fishery and sport fishery data following Sullivan 2000.

All statistical analyses and graphics were done on an IBM - type personal computer (Intel Pentium-II, 300 MHz) using Microsoft Office Professional. All data and analyses are stored in spreadsheet format on the ACA and NRS Edmonton Metropolitan office, Fisheries computers, on recordable compact discs (650 MB). Also, all data is loaded and stored in AE, NRS, Fisheries Management Information System (FMIS).

RESULTS

Angler Survey: excluding June 22 – 23 derby

During the survey period, 1,572 anglers were interviewed (Table 1 and Appendix 1). The total number of anglers was estimated at 4,830. The estimated effort was 19,426 hours resulting in an estimated angling pressure of 4.8 angler-hours / ha. The estimated harvest of legal-sized walleye was 1,315 fish (Table 2). The estimated number of sublegal size walleye reported released by anglers 14,946. It is estimated anglers actually released 5,944 sublegal size walleye. The yield of legal-size walleye was estimated at 1,842 kg (0.45 kg / ha). Assuming 10% release mortality, the yield of released, but dead walleye was 287 kg (5,944 walleye*0.1 mortality*0.482 kg mean weight) or 0.070 kg / ha. The sport yield of harvested walleye during the period of this survey was therefore 0.52 kg / ha, of which 16% was released, dead walleye.

The distributions of harvests and catches for walleye are shown in Appendices 1.2 and 1.3. Biological samples were collected from 628 walleye (283 angler harvest, 345 test fishery sample) (Appendix 2 and 3), 269 pike (75 angler harvest, 191 test fishery sample) (Appendix 4), and 29 perch (20 angler harvest, 9 test fishery sample) (Appendix 5).

Angler census: derby only

During the 22nd and 23rd of June 2000, 298 anglers were surveyed during the Pinehurst Lake derby. The observed total angling effort was 2,362 hours. Zero walleye were kept. However, 6,906 walleye (5,648 sublegal-sized and 1,258 legal-sized) were reported released. Assuming 10% release mortality, the yield of released, but dead walleye was approximately 386 kg (6,906 walleye*0.1 mortality*0.559 kg mean weight) or 0.095 kg / ha.

Two pike were kept and 693 pike were reported released. One perch was harvested and 61 were reported released. Biological data for these harvested fish are reported in Appendices 4 and 5.

Entire survey: angler survey and derby census

The total number of anglers using Pinehurst Lake during the survey period was estimated at 5,128. The total estimated effort was 21,788 hours (5.4 angling hours / hectare). The total sport yield of walleye during the survey period would therefore be 0.615 kg / ha (0.45 + 0.070 + 0.095), of which 27% was released, dead walleye.

Test Angling

Angling test fisheries were conducted on 19 days, from 22 May to 22 August. A total of 221.0 hours were spent test angling. A total of 345 walleye and 191 pike were caught and measured. Of these walleye, 63 were legal-size and 282 were sublegal-size.

Table 1. Observed and reported catch rates of anglers; Pinehurst Lake, 2000.

CREEL DATA	1985	1992	1993	1994	1997	2000	Derby, 2000
# days surveyed	71	62	66	34	37	30	2
# anglers interviewed	10,353	6,398	8,845	4,852	3,414	1,572	298
# angling hours reported	27,415	20,157	28,540	15,736	12,218	6,330	2,362
WALLEYE DATA							
Walleye kept / angler-hr	0.166	0.151	0.122	0.129	* 0.101	* 0.072	* 0.000
Walleye released legal-sized / ang-hr	N/A	N/A	N/A	N/A	0.026	0.052	0.533
Walleye released sublegal / ang-hr	N/A	N/A	N/A	N/A	0.629	0.770	1.86
Total walleye released / ang-hr	0.083	0.833	0.631	0.518	0.656	0.820	2.40
NORTHERN PIKE DATA							
Pike kept / ang-hr	0.110	0.113	0.082	0.083	* 0.083	* 0.018	* 0.001
Pike rel. legal-sized / ang-hr	N/A	N/A	N/A	N/A	N/A	0.016	0.016
Pike rel. sublegal / ang-hr	N/A	N/A	N/A	N/A	N/A	0.450	0.293
Total pike released / ang-hr	0.066	0.305	0.151	0.109	0.057	0.465	0.309
YELLOW PERCH DATA							
Perch kept / ang-hr	0.075	0.081	0.030	0.041	0.002	0.008	0.00
Perch rel. / ang-hr	0.082	0.076	0.009	0.018	0.001	0.011	0.026

*AE, NRS management strategy introduced restrictive size and bag limits

Table 2. Whole lake estimates; Pinehurst Lake, 2000.

	1997 WHOLE LAKE ESTIMATE (95% CI)	2000 WHOLE LAKE ESTIMATE (Including derby) (95% CI)
# Anglers	7,930 (+-14.0%)	5,128 (+-16.7%)
# Hours	27,918 (+-15.4%)	21,788 (+-17.3%)
Hours / hectare	6.8 (+-15.4%)	5.4 (+-17.3%)
# legal-sized walleye harvested	2807 (+-18.3%) (43 cm TL max)	1,315 (+-17.3%) (50 cm TL max)

Compliance

Angler's reports of released sublegal and legal size pike are likely exaggerated. The compliance parameters in Table 3 are taken from Jordan Walker's (Alberta Environment, Fish and Wildlife Service, Enforcement Field Services) M. Sc. work in progress. Walker's work is based on Sullivan's *Exaggeration of walleye catches by anglers in Alberta and perceived hyperstability in reported catch rates* (2000). At this juncture, questions regarding these parameters should be directed to Walker and Sullivan.

Table 3. Non-compliance with size limits; Pinehurst Lake, 2000.

PARAMETER	Using angler's reported legal-size released (LCI – UCI, 95%)	Using 10% of angler's reported legal-size released (LCI – UCI, 95%)	If all legal-size fish were kept (zero legal-size fish released) (LCI – UCI, 95%)
Illegal harvest (%)	0.74% (0.83% - 1.60%)	1.31% (0.83% - 1.60%)	1.44% (0.83% - 1.60%)
Exaggeration (1X)	1.3X	2.3X	2.6X

Historical

Chipeniuk (1975) reports that "all sources agree that originally Pinehurst had stupendous numbers of big pickeral" and "many of them went 10 – 12 pounds." Chipeniuk's sources conclude that "big pickeral like the big pike, are a thing of the past...there can be no question but that the responsibility is exclusively that of the commercial fisherman...for the work was done in the years before the government road opened the flood gates to tourism". The historical survey of Valastin and Sullivan (1997) reports that Pinehurst Lake once supported provincially-famous fisheries for walleye and pike. Respondents to their survey reported that "it was easy to catch limits of walleye between four and six pounds."

Status of the Walleye Fishery

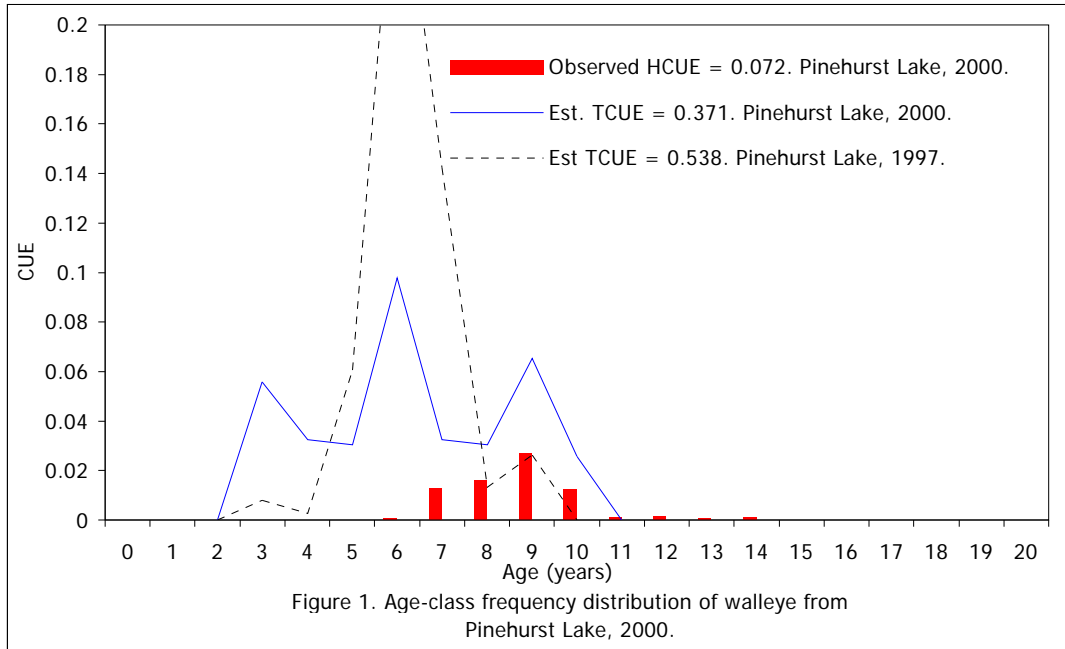
In Table 4, characteristics of the walleye fishery at Pinehurst Lake are compared to the parameters listed for Alberta's walleye stock classification criteria.

1. Age-class Distribution

The age-class distribution of walleye harvested by anglers is shown in Figure 1. This is a relatively narrow distribution with moderate to poor densities of the older age-classes. The 2000 test fishery data shows moderate densities of age 3 through 9 walleye when compared to the 1997 test fishery data which showed stronger densities of age 5, 6 and 7 walleye. Both the test fishery and the sport harvest distributions verify the absence walleye older than 10 years of age. The mean age of walleye in the angler harvest was 9 years (n = 158). The mean age of the walleye captured in the test fishery was 6 years (n = 159). The mean age from the test fishery is likely more representative of the population, due to size limits imposed on sport-

Table 4. Criteria for classifying status of walleye fisheries; Pinehurst Lake, 2000.
(from Sullivan 1994)

	TROPHY	STABLE	VULNERABLE	COLLAPSED
Age-class Distribution	Wide 8 or more age-classes mean age > 9	Wide 8 or more age-classes mean age = 6 - 9	Narrow 1 - 3 age-classes mean age = 4 - 6 few old (> 10 years) fish	Narrow mean age = 6 - 10
Pinehurst Lake, 2000.			Test fishery mean age = 6 yr. Decline in recruitment	
Age-class Stability	Very stable 1 - 2 age-classes out of smooth catch curve	Relatively stable 2 - 3 age-classes out of smooth catch curve	Unstable 1 - 3 age-classes support fishery	Stable or unstable Recruitment failures
Pinehurst Lake, 2000.			Unstable. Few age- classes support sport- fishery.	
Length-at-age	Very slow 50 cm (FL) in 12 - 15 years	Slow 50 cm (FL) in 9 - 12 years	Moderate 50 cm (FL) in 7 - 9 years	Fast 50 cm (FL) in 4 - 7 years
Pinehurst Lake, 2000.			50 cm in 9 - 10 years	
Catch rate	Total = > 2 / h >50 cm (TL max) = > 1 / h	Total = >1 / h >50 cm (TL max) = >0.3 / h	Total = 0.5 - 1 / h >50 cm (TL max) = < 0.3	Total = < 0.1 >50 cm (TL max) = < 0.02
Pinehurst Lake, 2000.			Legal-sized kept = 0.068 / h Estimated sublegal release = 0.303 / h Reported sublegal release = 0.78 / h	
Age-at-maturity	Females 10 - 20 Males 10 - 16	Females 8 - 10 Males 7 - 9	Females 7 - 8 Males 5 - 7	Females 4 - 7 Males 3 - 6 Ages will vary with Age-class distribution
Pinehurst Lake, 2000.			Females at 7 (mean age = 8.7 yr) Males at 7 (mean age = 8.9 yr)	



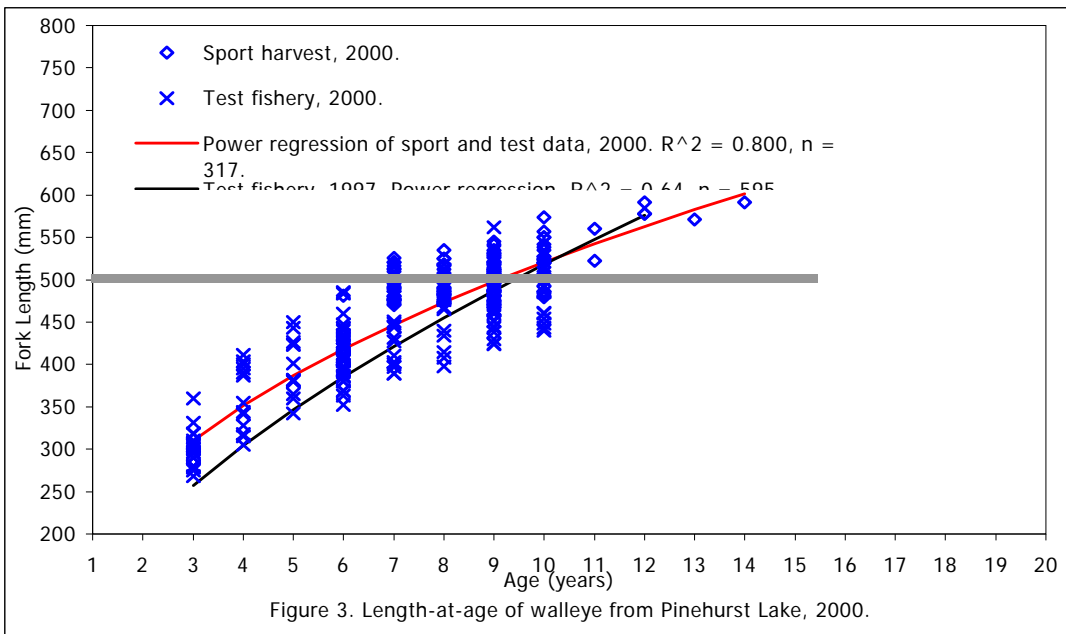
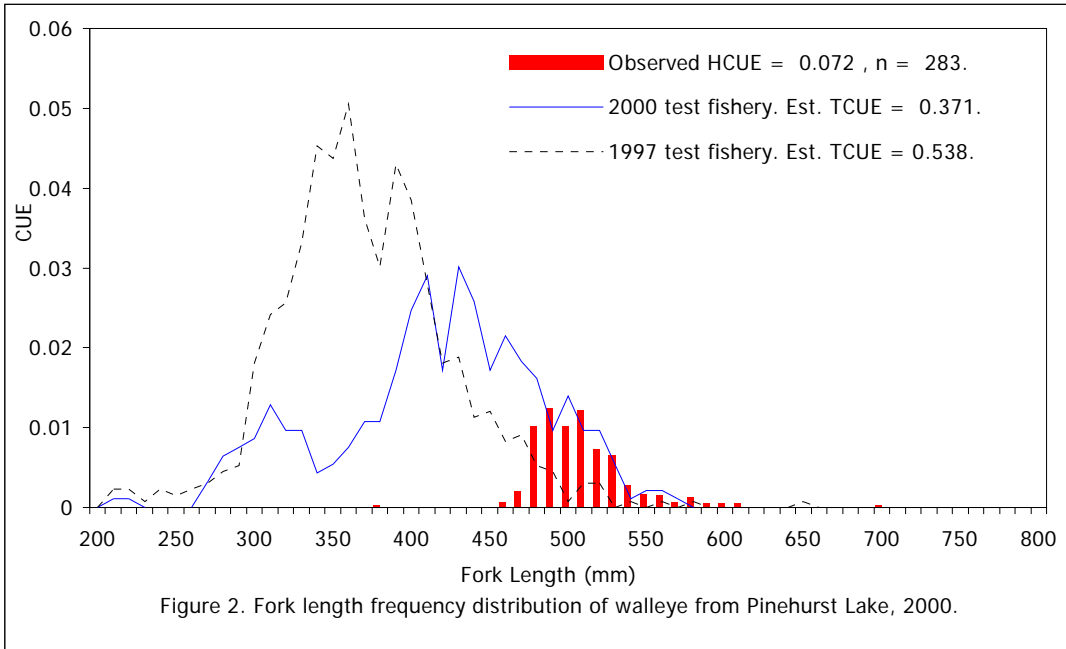
anglers. The sport and the test fishery age-class distributions are indicative of a walleye stock with a vulnerable status.

2. Age-class Stability

In 1997, the age-class distribution of walleye was very truncated: there was very few fish younger than age 5 (Figure 1). Large differences in year-class strengths indicate an unstable age-class distribution. The increase in size limit in 1998 to 50 cm (TL max) has likely afforded more protection to the older, mature fish and will likely increase recruitment. It appears the density of sublegal-size walleye has declined since 1997 (Figure 2). This heavy mortality may not entirely be a result of sport harvest as the yield of released but likely dead walleye may also negatively affect the population. The lack of older age-classes is a classic symptom of growth overfishing (Cushing 1981) and is indicative of a vulnerable fishery.

3. Index of Growth

The length-at-age of walleye from Pinehurst Lake (Figure 3) suggests a moderately fast growth rate. The length-at-age of the young walleye may have increased since the previous survey. The approximate age of 50 cm fork length (FL) walleye from Pinehurst Lake was 9 – 10 years old. This growth rate is indicative of a walleye stock with a vulnerable status.



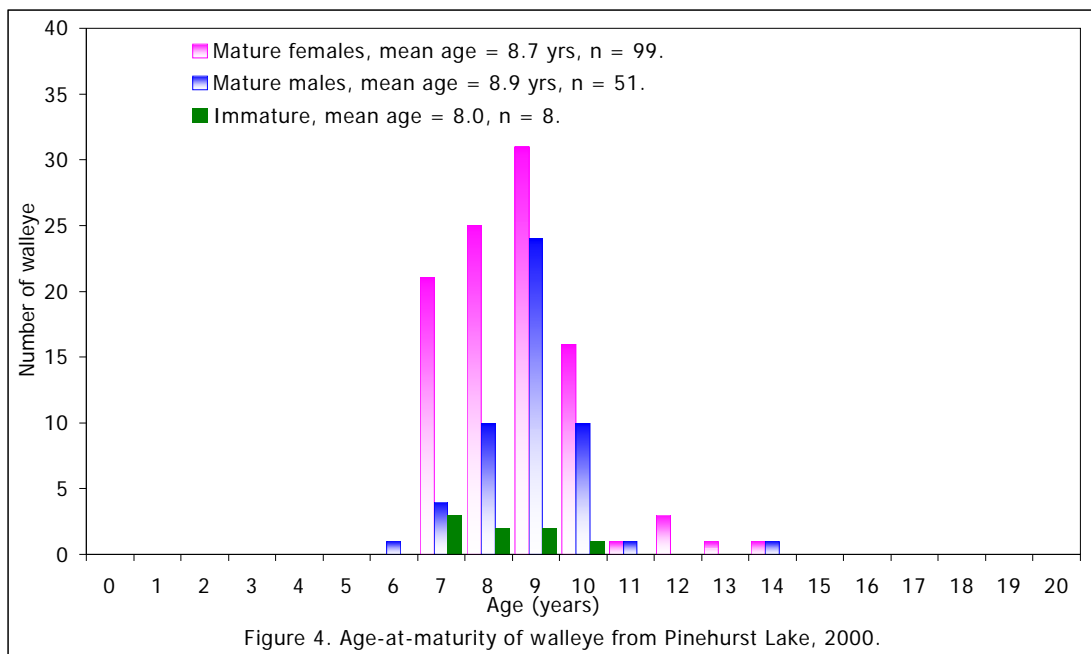
4. Catch Rate

The observed sport harvest rate on legal-size walleye (>50 cm TL max) was low at 0.068 walleye kept / h. The reported release rate on sub-legal walleye was 0.770 walleye released / h. Based on the test fishery, the estimated sub-legal release rate was 0.303 walleye released / h. The estimated total CUE on all sizes of walleye would therefore be 0.371 (0.068 + 0.303). The estimated total CUE has decreased 31% from 0.538 in 1997 to 0.371 in 2000.

Pinehurst is effectively a catch and release fishery with the relatively poor legal-sized harvest rate. Moderate recruitment and low densities of older fish are indicative of a vulnerable fishery.

5. Age-at-Maturity

The distribution of age-at-maturity (Figure 4) from angler-harvested walleye is biased since the minimum size limit requires anglers to release all sub-legal walleye. Those walleye that were sampled were quite young and mature. This suggests that the walleye in Pinehurst Lake have an accelerated maturation schedule. Female walleye were first harvested at age 7 and all were mature. Male walleye were first harvested at age 6. Of this small sample, all were mature. The ages of mature female and male walleye are indicative of a walleye stock with a vulnerable status.



DISCUSSION

Based on the criteria used to classify walleye stocks in Alberta, the walleye population in Pinehurst Lake is in a vulnerable state. The age-class distribution of the sport-harvested walleye is relatively narrow with poor representation of older, legal-sized age-classes. The test fishery data shows an increase in the densities of legal-sized walleye: age 8, 9 and 10 walleye as compared to the same age-classes of the 1997 survey. Both age-class distributions measured in the sport harvest and the test fishery were unstable, distinguished by lower densities of the 1993 – 1996 year-classes and a marked increase in the 1996 and 1997 year-classes. The length-at-age of young walleye seems to have increased since the 1997 survey. The observed CUE on harvested walleye was low, although the total estimated catch rate was moderate. The decline in the total estimated catch rate was likely due to the increase in the minimum size (50 cm TL max) in 1998. Walleye were apparently maturing at young ages. These factors all suggest that the walleye fishery in Pinehurst Lake is experiencing severe growth overfishing and is vulnerable.

The walleye in Pinehurst Lake have responded to the regulation changes recommended by the walleye management strategy. However, the steep catch curves indicate high mortality from the sport fishery (including possible high release mortality) or domestic harvests. The decrease in the density of the 1991 year-class (age 9) from its strong density in 1997 (then age 6) is likely a result of this mortality. However, the regulation change in 1998 reduced this mortality and has likely resulted in an increase in recruitment. If the 1997 year-class continues to increase in strength this potential recruitment may aid in the recovery of walleye at Pinehurst Lake. It is extremely important to continue to monitor the densities of sublegal walleye and the affect of release mortality. As these young walleye recruit into the sport fishery, their excessive harvest will prevent any future recovery of the fishery. It is necessary to continue to monitor this fishery with special attention given to changes in angling pressure and to the survival of these vulnerable, young walleye.

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APPENDICES

Appendix 1.1. Daily summary of angler survey data. [Pinehurst Lake, 2000]

Month	Day	# Anglers	# Hours	Walleye Kept	Walleye Released < 50 cm TL	Walleye Released > 50 cm TL	Pike Kept	Pike Released < 63 cm TL	Pike Released > 63 cm TL	Perch Kept	Perch Released
Totals	30	1572	6330.25	454	4852	332	119	2841	100	54	68
5	24	9	24	3	34	0	0	12	0	0	1
5	25	47	178.5	22	100	11	3	100	0	1	0
5	26	71	257	21	84	0	2	128	0	1	2
5	27	72	363.5	47	161	2	10	163	4	1	0
6	7	33	123.5	23	120	0	0	58	5	2	0
6	8	6	28	4	32	0	0	9	0	0	0
6	10	6	8	0	2	0	0	2	0	0	0
6	11	14	55	0	0	0	0	18	1	0	0
6	21	79	381.75	28	397	45	1	164	3	1	1
6	22	128	536	50	699	83	1	207	10	6	4
6	23	117	455	25	716	133	0	156	8	7	11
6	24	38	182	16	171	6	1	39	0	3	2
6	25	21	90	4	80	20	0	27	1	0	0
7	5	42	170.75	14	86	0	5	89	2	0	0
7	6	60	227	6	81	1	12	97	0	0	1
7	7	89	325.75	38	344	4	11	166	11	5	0
7	8	95	405.5	25	277	2	12	222	12	2	0
7	9	46	273	18	97	2	9	157	2	3	0
7	19	18	71	0	6	0	7	31	0	0	0
7	20	74	279	9	120	2	13	247	15	0	2
7	21	106	354.5	13	178	5	6	155	3	3	2
7	22	71	274	12	100	1	7	93	1	10	11
7	23	29	120	3	73	0	3	55	7	1	0
7	29	88	388	39	343	6	7	189	6	6	23
7	30	95	323	13	312	0	4	128	5	1	2
7	31	45	164.5	7	72	7	1	41	0	0	0
8	1	18	44.5	2	24	0	3	15	0	0	0
8	16	17	76.75	3	77	1	0	40	4	1	6
8	17	18	54.5	2	42	0	1	21	0	0	0
8	18	20	96.25	7	24	1	0	12	0	0	0

Appendix 1.2. Catch frequency distribution of harvested walleye. [Pinehurst Lake, 2000]

# WALL kept	# Anglers	% Anglers	Harvest	% WALL Harvested	Cumulative % WALL Harvested
0	1246	79.3	0	0.0	0.0
1	236	15.0	236	52.0	52.0
2	53	3.4	106	23.3	75.3
3	36	2.3	108	23.8	99.1
4	1	0.1	4	0.9	
5	0	0.0	0	0.0	
>5	0	0.0	0	0.0	
Totals	1572	100.0	454	100.0	

Appendix 1.3. Catch frequency distribution of released walleye. [Pinehurst Lake, 2000]

# WALL Released	# Anglers	% Anglers	# WALL Released	% WALL Released
0	607	38.6	0	0.0
1	229	14.6	229	4.4
2	152	9.7	304	5.9
3	126	8.0	378	7.3
4	73	4.6	292	5.6
5	69	4.4	345	6.7
6	46	2.9	276	5.3
7	57	3.6	399	7.7
8	28	1.8	224	4.3
9	11	0.7	99	1.9
10	46	2.9	460	8.9
>10	128	8.1	2178	42.0
Totals	1572	100.0	5184	100.0

Appendix 1.4. Methods of anglers and catch statistics for walleye. [Pinehurst Lake, 2000]

METHOD	# Anglers	% Anglers	# Hours	WALL kept	WALL Rel.	Harvest CUE	Rel. CUE
Artificial	516	32.8	1795.00	55	541	0.031	0.301
Commercial Baitfish	147	9.4	693.00	23	302	0.033	0.436
Seined Baitfish	0	0.0	0.00				
Leeches	704	44.8	3028.50	318	3490	0.105	1.152
Dewworms	165	10.5	658.75	53	826	0.080	1.254
Scent baits	0	0.0	0.00				
Miscellaneous	40	2.5	155.00	5	25	0.032	0.161
Totals	1572	100.0	6330.25	454	5184		

Appendix 1.5. Skill levels of anglers and catch statistics for walleye. [Pinehurst Lake, 2000]

SKILL	# Anglers	% Anglers	# Hours	WALL kept	WALL Rel.	Harvest CUE	Rel. CUE
Novice	180	11.5	676.00	16	240	0.024	0.355
Average	1270	80.8	5149.75	414	3958	0.080	0.769
Professional	122	7.8	504.50	24	986	0.048	1.954
Totals	1572	100	6330.25	454	5184		

Appendix 1.6. Target species of anglers and catch statistics for walleye. [Pinehurst Lake, 2000]

TARGET	# Anglers	% Anglers	# Hours	WALL kept	WALL Rel.	Harvest CUE	Rel. CUE
Walleye	949	60.4	4021.25	398	4599	0.099	1.144
Northern Pike	127	8.1	449.00	6	32	0.013	0.071
Yellow Perch	4	0.3	19.50	0	6	0.000	0.308
Any species	492	31.3	1840.50	50	547	0.027	0.297
Totals	1572	100	6330.25	454	5184		

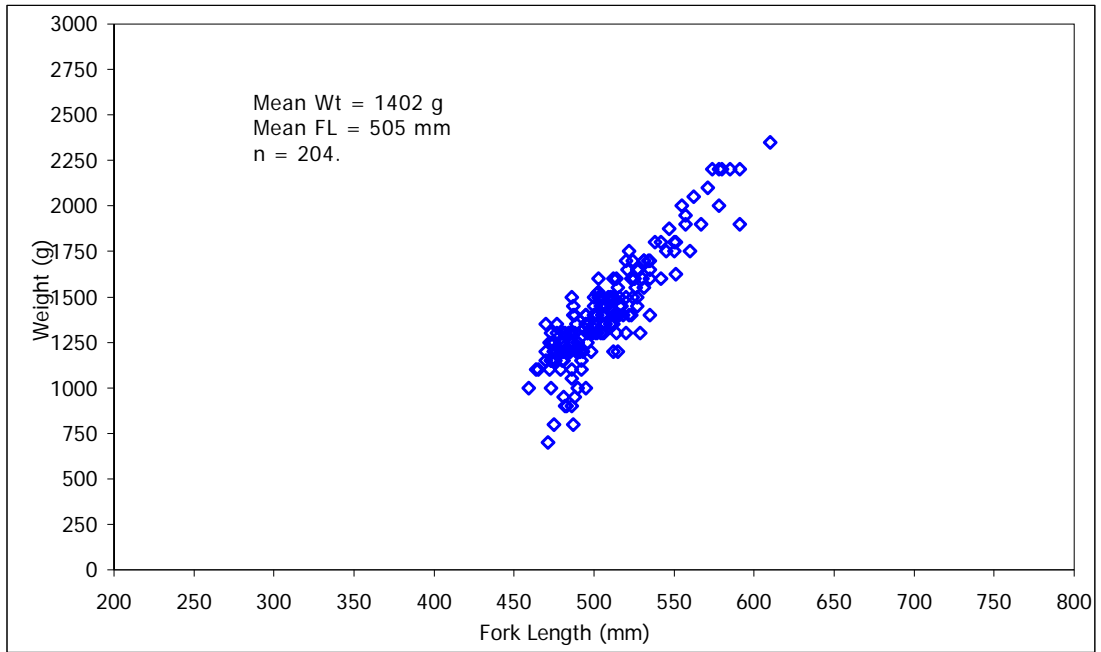
Appendix 1.7. Angler's use of electronic gear and catch statistics for walleye. [Pinehurst Lake, 2000]

ELECTRONICS	# Anglers	% Anglers	# Hours	WALL kept	WALL Rel.	Harvest CUE	Rel. CUE
None	357	22.7	1219.25	57	706	0.047	0.579
Depth Sounder	948	60.3	3975.25	312	2940	0.078	0.740
G.P.S.	0	0.0	0.00				
Depth Sounder + G.P.S.	267	17.0	1135.25	85	1538	0.075	1.355
Other	0	0.0	0.00				
Totals	1572	100	6329.75	454	5184		

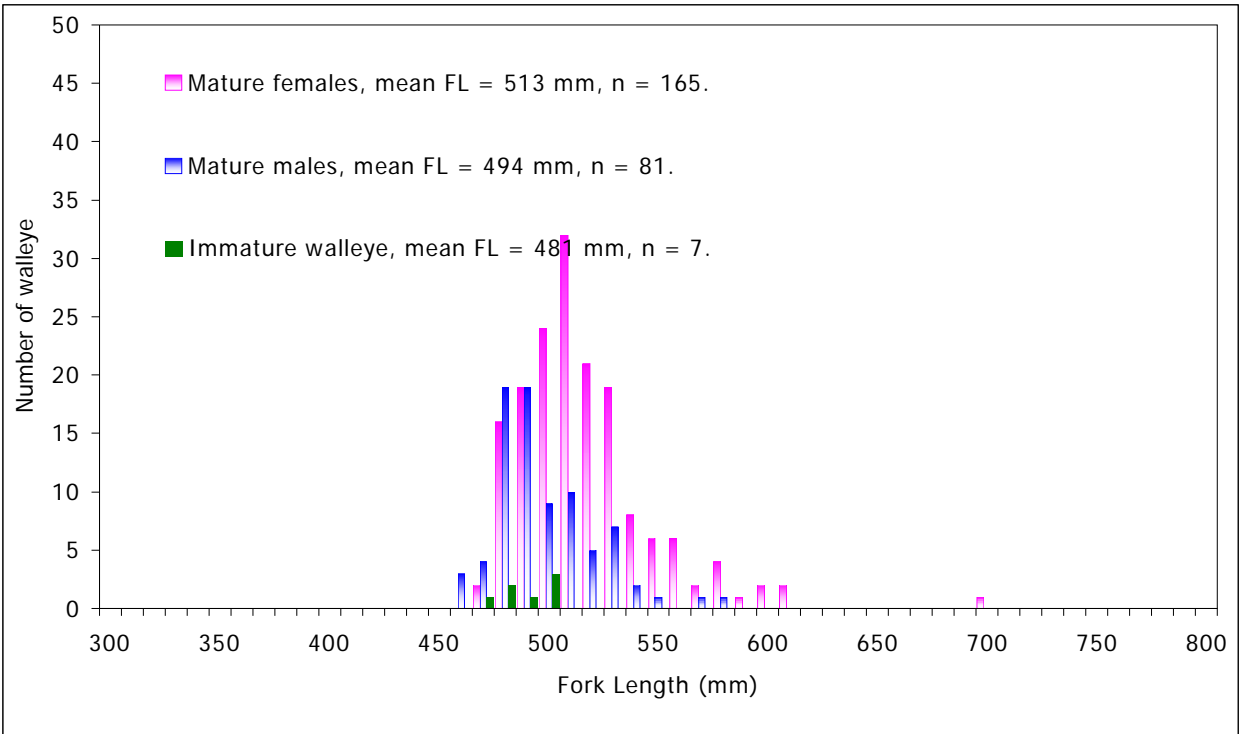
Appendix 1.8. Residence of anglers and catch statistics for walleye. [Pinehurst Lake, 2000]

RESIDENCE	# Anglers	% Anglers	# Hours WALL kept	WALL Rel.	Harvest CUE	Rel. CUE	
Local (50 km radius)	149	9.5	631.50	48	386	0.076	0.611
Edmonton	606	38.6	2307.75	172	1852	0.075	0.803
Ft. McMurray	1	0.1	5.00	0	2	0.000	0.400
Lac La Biche	28	1.8	102.50	1	78	0.010	0.761
Peace River	15	1.0	80.00	0	113	0.000	1.413
St. Paul / Bonnyville	233	14.8	1000.25	87	817	0.087	0.817
Edson / Hinton	4	0.3	20.00	0	31	0.000	1.550
Vegreville / Lloydminster	320	20.4	1339.50	90	976	0.067	0.729
Red Deer and east	106	6.7	424.50	21	418	0.049	0.985
Rocky Mtn. House / Nordegg	2	0.1	8.00	2	2	0.250	0.250
South east slopes	6	0.4	37.50	1	92	0.027	2.453
Calgary and west	40	2.5	175.50	18	193	0.103	1.100
Southern Alberta	47	3.0	125.50	8	152	0.064	1.211
Saskatchewan	1	0.1	2.00	0	0	0.000	0.000
British Columbia	7	0.4	30.25	1	26	0.033	0.860
Nonresident	6	0.4	33.50	5	43	0.149	1.284
Totals	1571	100	6323.25	454	5181		

Appendix 2.1. Weight-at-length of walleye. [Pinehurst Lake, 2000]



Appendix 2.2. Length-at-maturity of sport-caught walleye. [Pinehurst Lake, 2000]



Appendix 2.3. Biological data from sport-caught walleye. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex 1 = immature 5 = mature female 10 = mature male
Number =	204	283	265	158	260
Mean =	1402	505	535	9	
1	1150	473	504	8	5
2	1700	524	559		10
3	1250	475	502	9	5
4	1400	487	519		5
5	2200	585	617		5
6	1400	515	543		5
7	1300	482	510	8	5
8	1350	495	529		5
9	1400	500	530	10	10
10		483	510		5
11	1750	545	573	9	5
12	1350	507	536		5
13	1475	510	546	9	5
14	1350	507	535		5
15	1200	477	509	7	5
16	1400	505	536		5
17	1500	516	546	7	5
18	1250	475	507		10
19	950	488	513	9	5
20	1225	490	517		10
21	1700	535	565	9	5
22	950		505		5
23	1500		521	14	10
24	1200	483	512	9	10
25	1500	503	530	8	5
26	1350	489	520		10
27	1250	475	498	7	5
28	1350	507	540		5
29	1150	476	502	8	10
30	1600	530	558		5
31	1250	490	521	7	5
32		500	526		5
33	1225	481	514	7	10
34	1500	510	541		5
35	1325	494	528	9	10
36	1800	551	585		5
37	1450	504	530	8	10
38	2350	610	642		5
39	1350	495	528	7	5
40		505	526		5
41	1800	550	587	10	5
42	1250	479	506		10

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
43	1650	521	544	10	10
44	1450	487	516		10
45	1350	512	539	9	5
46	1400	507	541		5
47	1250	496	526	9	5
48	1500	504	534		5
49	1300	499	532	9	5
50	1350	496	525		10
51	1500	527	559	10	5
52		564	595		10
53	1300	498	524	7	5
54	1300	504	530		5
55	1300	502	537	8	5
56	1100	479	510		5
57	1350	510	538	9	5
58	1400	522	551		10
59		498	526	9	10
60		513	542		
61	1500	500	532	9	10
62	1625	551	583		5
63	1750	560	592	11	5
64	1300	520	545		5
65	1450	527	555	9	5
66	1550	531	559		5
67	1000			7	1
68	2050	562	595		5
69	1400	535	569	10	5
70	2000	555	584		5
71	1400	513	541	7	5
72	1400	495	521		10
73	1600	535	561	8	5
74	1400	500	526		5
75	1100	472	502	8	10
76	1200	475	505		10
77	1300	499	530	7	5
78		508	536		
79		511	541	9	5
80	2200	578	615	12	5
81	1325	500	535	8	5
82	900	482	510	9	10
83	1500	505	525	9	5
84	1650	527	561	10	5
85	800	475	505	9	10
86	700	471	501	9	1
87	2000	578	608	12	5

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
88	1200	479	512	8	5
89	900	486	521	10	10
90	1300	529	558	9	5
91	1700	534	561	9	10
92	1900	557	590	10	5
93	800	487	515	9	5
94	900	483	514	8	10
95	1200	515	547	10	5
96	1000	490	520	7	10
97	1450	508	540	8	5
98	1000	495	525		5
99	950	481	509	10	1
100	2200	574	610	10	10
101	1600	542	568	9	5
102	1400	506	537		10
103	1300	486	511	8	10
104	1400	501	534		5
105		485		9	
106		544			10
107	1150	481		8	5
108	1520	502	531		5
109	1150	474	506	8	10
110	1450	500	532		5
111		379			
112			543	10	10
113		510	541	9	5
114	1250	480	510		5
115	1600	525	555	10	5
116	1250	475	510		10
117	1250	490	517	8	5
118	2200	580			5
119		485		9	10
120		494			5
121		497		8	5
122		498			
123		506		10	10
124		527			5
125		491		8	5
126	1250	474	507		10
127	1200	470	503	7	5
128	1350	470	504		10
129		487	518	9	5
130	1950	557	592		5
131	1450	516	552	9	5
132	1300	501	527		10

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
133	1500	524	554	10	5
134	1500	509	541		5
135		505			
136	1150	480	514	7	5
137	1400	488	518		5
138		468	494		5
139		472			
140		520		10	5
141		512			
142		475		9	10
143		517		8	5
144		526		9	5
145		507	532	9	
146		488	516		
147		512	539	9	5
148		521	547		5
149		521	550	9	10
150		476	507		5
151		482			
152			535	9	5
153		471	503	7	5
154		602	631		5
155		521	556	7	5
156		499	528		5
157	1800	542	575	10	5
158		693	730		5
159	1300	506		10	5
160	1200	475			10
161	1500	512		9	5
162		492	521		5
163		503	532	7	5
164		507	536		5
165		521	550	7	5
166		473	501		5
167	1300	481	510	9	10
168	1250	487	516		5
169	1750	522	557	11	10
170	1400	512	524		5
171	1100	492	520	7	5
172	1350	506	535		
173	1600	512	545	8	10
174	1250		515	8	5
175		520	552	9	10
176		522	557		5
177		480	510	9	10

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
178	1300	485	512		
179	1750	550	578	10	5
180	1200	489	520		5
181	1100	465	499	9	10
182	1450	517	549		5
183		498	530	10	5
184		506	516		10
185	1600	525	554	8	5
186	1500	510	545		10
187		480	509	10	5
188	1400	506	535		5
189	1000	459	485	9	10
190		499	510		10
191	1900	591	621	14	5
192	1900	567	604		5
193	1500	486	515	9	5
194	1250	472	502		1
195	1250	481	524	9	5
196	1200	493	525		1
197	1350	500	531	7	
198	1550	515	545		5
199	1400	502	535	8	5
200	1650	535	567		5
201	1300	514	544	9	5
202	1600	514	543		5
203	1550	526	556	7	5
204		476	517		10
205	1200	477	506	8	5
206	1100	464	492		1
207		504	526	8	10
208	1150	492	513		1
209	1050	486	510	7	5
210	1200	512	541		10
211	1100	486	510	8	10
212	1200	491	521		5
213	1450	506	537	8	10
214		458	491		10
215	1250	485	517	9	10
216	1300	505	536	9	5
217		479	506	10	10
218		485	515		5
219		529	564	9	5
220	1400	523	546		10
221	1150	473	498	7	10
222	1400	507	539		5

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
223	1525	503	532	10	5
224	1600	523	559		5
225	1350	510	537	7	5
226	1300	496	530		5
227	1400	495	523	9	1
228		516	536		10
229	1350	477	506	7	5
230	1300	484	514		10
231	1200	476	509	7	5
232		481	512		
233		478	504	7	
234		495	520		
235		462	492		
236	1600	525	552	8	5
237	1350	496	530	8	5
238	1300	477	510		10
239	1800	538	572	10	10
240	1300	473			10
241	1300	484	510	10	10
242	1300	488	513		5
243	1500	512	542	7	5
244	1700	531	563		5
245		458	485		10
246	1200	485	513		
247	1400	502	532	9	10
248			495		5
249	2200	591	630	12	5
250	1650	528	557		5
251		486	513		
252		503	532	9	10
253	1150	470	503	9	10
254		486	516		
255	1400	505	534	8	5
256	1200	491	521		5
257	1300	481	514	6	10
258	1700	531	561		5
259	1000	473	507	9	5
260	1300	496	520		10
261		492	520	9	10
262	1200	498	520		5
263	1200	481	510	9	10
264		520	561		
265		493	520		
266		535	567		
267		482	516		

Appendix 2.3. Biological data from sport-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
268		468	496	9	10
269		502	530		
270		590	629		
271		488	522		
272	1400	518	547	8	5
273		506	532		
274		478	504		
275		501	531	8	5
276	1400	516	542	8	5
277	1400	501	532	8	5
278	2100	571	594	13	5
279	1500	520	550	10	5
280		480	507	7	10
281	1200	480	504	9	10
282	1700	520	558	10	10
283	1250	487	518	9	10
284		531	563	9	5
285	1600	503	532	9	5
286		486	521		5
287		495	525	9	5
288	1650	527	568		10
289	1200	484	514	8	5
290	1875	547	579		5

Appendix 3. Biological data from test-caught walleye. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
Number =	345	67	159
Mean =	412	428	6
1	297	559	3
2			
3	319		3
4	393		
5	308		3
6	412		
7	443		5
8	429		
9	451		9
10	395		
11	461		10
12	397		
13	363		6
14	506		
15	496		8
16	476		
17	493		7
18	517		
19	478		8
20	503		
21	448		10
22	404		
23	409		6
24	435		
25	380		5
26	432		
27	306		3
28	456		
29	387		6
30	451		
31	442		6
32	444		
33	410		6
34	481		
35	512		9
36	435		
37	463		9
38	421		
39	401		5
40	470		
41	391		6
42	428		

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
43	406		6
44	438		
45	476		8
46	480		8
47	503		
48	380		5
49	461		
53	495		9
54	355		
55	470		9
56	435		
57	430		9
58	318		
59	280		3
60	395		
61	440		8
62	410		
63	395	418	6
64	480		
65	492		10
66	485		
67	515		9
68	500		
69	495		8
70	480		
71	410		7
72	393		
73	443		6
74	415		
75	360		3
76	400		
77	447		6
78	465		
79	465		9
80	430		
81	400		7
82	426		
83	413		6
84	280		
85	445		7
86	420		
87	408		8
88	290		
89	405		
90	428		

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
91	369		6
92	281		
93	431		6
94	476		
95	290		3
96	400		
97	300		3
98	420		
99	380		6
100	374		
101	406		6
102	469		
103	426		5
104	439		
105	423		5
106	464		
107	404		6
108	334		
109	435		6
110	435		
111	365		5
112	361		
113	438		9
114	403		
115	355		4
116	435		
117	405		6
118	465		
119	480		9
120	460		
121	352		6
122	359		
123	382		5
124	417		
125	434		6
126	442		
127	360		5
128	454		
129	387		4
130	395		
131	418		6
132	324		
133	507		9
134	405		
135	398		6

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
136	434		
137	443		10
138	427		
139	421		6
140	452		
141	463		9
142	461		
143	460		9
144	460		
145	450		5
146	449		
147	424		5
148	419		
149	411		4
150	327		
151	395		4
152	295		
153	468		8
154	471		
155	484		6
166	495		
167	500		10
168	550		
169	562		9
170	525		
171	505		9
172	500		
173	533		9
174	472		
175	474		9
176	492		
177	423		6
178	427		
179	413		6
180	460		
181	427		6
182	380		
183	318		3
184	387		
185	385		6
186	410		
187	380		6
188	334		
189	443		9
190	460		

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
191	290	305	3
192	375	398	
193	405	446	6
194	438	462	
195	425	445	6
196	422	446	
197	424	449	9
198	455	481	
199	407	431	6
200	383	404	
201	386	410	6
202	294	311	
203	310	326	3
204	453	481	
205	415	440	8
206	364	385	
207	512		8
208	511		
209	525		9
210	552		
211	515		9
212	521		
213	308	326	3
214	403	428	7
215	346	373	
216	328	345	4
217	373	394	
218	452	480	9
219	292	307	
220	393	415	6
221	458	497	
222	465	497	8
223	396	415	
224	290	307	3
225	376	400	
226	302	320	3
227	472	501	
228	393	418	6
229	507	536	
230	474	505	9
231	504	538	
232	368		6
233	214		
234	305		4
235	314		

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
236	275		3
237	296		
238	307		3
239	426		
240	268		3
241	325		
242	342		5
243	510		
244	493	520	10
245	280		
246	306		3
247	285		
248	331		3
249	464		
250	278		3
251	469		
252	398		8
253	404		4
254	264		
255	284		
256	304		3
257	315		
258	485		6
259	325		
260	280		3
261	460		
262	400		4
263	435		
264	300		3
265	405		
266	390		4
267	390		
268	325		
269	405		
270	460		6
271	390		
272	430		
273	370		
274	382		5
275	396		
276	318		4
277	485		
278	422		6
279	303		
280	525		9

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
281	475		
282	434		8
283	268	282	
284	295	312	3
285	430	454	
286	431		6
287	202		
288	344		4
289	330		
290			4
291	410		
292	341		4
293	305		
294	389		7
295	357		
296	481		9
297	551		
298	444		7
299	431		
300	409		6
301	439		
302	482		7
303	530		
304	425		9
305	393		
306	454		10
307	315		
308	440		6
309	462	490	
312	431	458	7
313	445	468	
314	427	452	7
315	392	415	
316	448	475	7
317	315	335	
318	440	469	10
319	501	527	
320	460	487	10
321	305	327	
322	451	477	7
324	424	450	
325	397	421	7
326	321	337	
327	516	547	10
329	379	402	

Appendix 3. Biological data from test-caught walleye, con't. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
330	514	549	9
331	382	408	
332	445	472	9
333	494	510	
334	315		4
336	323	342	
337	485	518	10
338	366	387	
339	389	416	7
340	350	374	
341	517		
342	420		
343	394		
344	415		
345	453		
346	404		
347	385		
348	340		
349	405		
350	415		
351	422		
352	430		
353	436		
354	413		
355	420		
356	424		
357	405		
358	369		
359	402		
360	479		
361	491		
362	542		
363	490		
364	363		
365	386		

Appendix 4. Biological data from sport-caught pike. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex 1 = immature 5 = mature female 10 = mature male
Number =	57	75	74	79	1
Mean =	2658	761	715	7	
1			630	5	
2	2600	715	745	8	5
3		656	694	7	
4			570	4	
5			546	4	
6	3100	746	782	6	
7	1000	494	531	3	
8	4200	800	850	10	
9	3900	788	832	10	
10	2200	660	704	4	
11	2200	650	696	6	
12	2500	695	732	10	
13	2700	693	732	9	
14	4500	845	889	8	
15	1750	607	647	6	
16	1800	633	669	6	
17		673	703	6	
18		641		5	
19		622	663	6	
20		625	666	4	
21	3000	733	760	13	
22	4000	807	857	7	
23	2000	618	656	5	
24	1725	612	650	5	
25	7400	1020	1059	16	
26	1650	599	637	5	
27	2800	693		12	
28	1400	611	650	5	
29	1800	617	657	5	
30		645	689	5	
31	3330	726		14	
32	1900	640	670	6	
33	2100	696	717	9	
34	3700	813	840	11	
35		643	684	5	
36	2100	643	680	15	
37	4000	862	884	10	
38	2350	701	715	6	
39	3100	733	781	11	
40	4000	837	872	8	
41	1700	619	656	5	

Appendix 4. Biological data from sport-caught pike, con't. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex
42	1750	609	650	6	
43	4900		889	14	
44	7700	965	1090	11	
45	3100	733	781	13	
46	1400	567	605	5	
47	1400	557	595	5	
48	1900	593	627	5	
50	2300	755	798	8	
51	1950	630	671	7	
52	2700	701	741	12	
53	1500	595	637	5	
54		751		10	
55		591	628	4	
56		655	698	8	
57	4500	861	910	10	
58	1800	625	665	6	
59	3000	765	791	8	
60	3000	740	786	19	
61	1500	604	645		
62	1200	573	615	5	
63		617	655	6	
64		668	713	5	
65	1400	688		7	
66		587	625	5	
67	1700	613	647	6	
68	2500		680	8	
69	1900	629	665	8	
70	2400	686		6	
71	2400	6644	685	8	
72		615	645	5	
73		632	668	5	
74		876	925	11	
75	2200	658	692	6	
76	2400	664	700	6	
77		619	657	6	
78		601	641	5	
79		728	776	11	
80		590	630	6	
81	2500	662	703	6	

Appendix 5. Biological data from test-caught pike. [Pinehurst Lake, 2000]

Sample #	Fork length (mm)	Total Length (mm)	Age (yrs)
Number =	191	105	100
Mean =	527	539	4
1	502		
2	526	557	4
3	517	550	
4	515	550	4
5	528	562	
6	457	488	3
7	478		
8	454	485	4
9		505	
10	612		5
11	586		
12	502		4
13	503		
14	405		3
15	480		
16	416		3
17	486		
18	418	447	3
19	504	531	
20	431	465	4
21	480	511	
22	521		4
23	415		
24	445		3
38	490	528	4
39	406		
40	497		4
41	447		
42	507		4
43	500		
44	485		4
45	453		
46	514		4
47	385		
48	484		4
49	495		
50	555		4
51	500		4
52	377		
53	472		3
54	420		
55	507		4
56	494		

Appendix 5. Biological data from test-caught pike, con't. [Pinehurst Lake, 2000]

Sample #	Fork length (mm)	Total Length (mm)	Age (yrs)
57	489		4
58	520	554	
59	525	558	5
60	418	445	
61	487	515	4
62	520	555	
63	408	435	3
64	470	502	
65	512	546	4
66	502	530	
67	510	538	4
68	420	447	
69	520	556	4
70	780		7
81	600	634	4
82	480	515	
83	508	540	4
84	528	557	
85	417	450	4
86	423	453	
87	442	470	3
88	463	490	
89	484	515	3
90	480	515	
91	467	490	4
92	448	476	
93	435	462	3
94	418	436	
95	538	565	5
96	555	585	
97	468	498	4
98	509	543	4
99	556		
100	506		4
101	508		
104	492		
105	463		3
106	513		
107	543		4
108	525		
109	530		4
110	427		
111	450		3
112	521		
113	504		4

Appendix 5. Biological data from test-caught pike, con't. [Pinehurst Lake, 2000]

Sample #	Fork length (mm)	Total Length (mm)	Age (yrs)
114	489		
115	518		4
116	504		
117	477		3
118	405		
119	483		4
120	490		
121	472		4
122	496		
123	401		3
124	535		
125	412		3
126	482		
127	535		4
128	449		
129	582		5
130	494		
131	524		4
132	556		
133	522		4
134	448		
135	476		4
136	532		
137	568		4
138	428		
139	534		4
140	476		
141	499		
142	465		
143	467		4
144	499		
145	573		4
146	431		
147	510		4
148	507		
149	534		4
150	534		
151	495	528	
152	459	492	4
153	485	520	
154	517	555	5
155	613	655	
156	488	519	4
157	393	420	
158	487	517	4
159	525	562	
160	517	554	4
161	489	522	

Appendix 5. Biological data from test-caught pike, con't. [Pinehurst Lake, 2000]

Sample #	Fork length (mm)	Total Length (mm)	Age (yrs)
162	492	524	4
163	532	566	
164	534	569	5
165	571	610	
166	520		5
167	521	554	
168	533	570	4
169	417	443	
170	468	499	4
171	494	530	
172	509	547	5
173	595	640	5
174	639	676	6
175	596	641	5
176	607	645	5
177	420	450	4
178	508	541	
179	514	550	4
180	487	514	
181	568	602	4
182	543	581	
183	5556	589	4
184	496	527	
185	576	611	4
186	556	589	
187	522	556	4
188	516	553	
189	587	627	4
190	535	566	
191	485	521	4
192	525	558	
193	545	572	4
194	671	710	10
195	421	457	4
196	447	480	
197	569	612	7
198	525	559	
199	463	497	4
200	520	555	
201	535	571	5
202	548	583	
203	464	495	4
204	519	557	
205	494	526	3
206	472	505	
207	629	683	8
208	627	669	5
209	457	492	

Appendix 5. Biological data from test-caught pike, con't. [Pinehurst Lake, 2000]

Sample #	Fork length (mm)	Total Length (mm)	Age (yrs)
210	494	529	4
211	488	523	
212	512	546	4
213	475	510	
214	565	599	5
215	557		
216	489		4
217	521		

Appendix 6. Biological data from sport-caught perch. [Pinehurst Lake, 2000]

Sample #	Weight (g)	Fork Length (mm)	Total Length (mm)	Age (yrs)	Sex 1 = immature 5 = mature female 10 = mature male
Number =	6	20	16		
Mean =	228	261	265		11
1	200	245	256		5
2		301	314		5
3	100	235	246		5
4		248	258		5
5		261	273		5
6		246	256		
7		265	270		
8		244			
9	300	264	273		5
10	290	249	260		1
11		237	249		1
12		266	278		5
13		265	275		5
14	300	250	280		5
15		326			
16		325			
17		268			
18	175	228	238		
19		247	261		
20		250	260		

Appendix 7. Biological data from test-caught perch. [Pinehurst Lake, 2000]

Sample #	Fork Length (mm)	Total Length (mm)	Age (yrs)
Number =	9	3	
Mean =	250	253	
1	261		
2	269		
3	269		
4	274		
5	247	260	
6	256	270	
7	203		
8	250		
9	220	229	

Appendix 8. Creel survey form. [Pinehurst Lake, 2000]